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NOTES ON THE FAUNA OF THE COUNTRY OF THE CHESS AND GADE.

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For some years past, and particularly since the year 1910, I have made an extensive series of notes on many species of animals in the country of the Chess and Gade. These notes and others to be made later will be the chief sources of the following account of the fauna of the above-mentioned country. At present, those most easily adapted for publication relate to the Rotifers, and these animals will be described first, following on with other forms of animal life in the order which may seem to be most convenient.

Particular attention will be given to the conditions under which the various species occur, the relative numbers of individuals of different species, and, in some cases, certain changes which have taken place and are taking place in the numbers of individuals of the same species.

The country of the Chess and Gade is somewhat triangular in form, its base being a sinuous line on the southern side of the Chilterns, and its apex being near Rickmansworth, where the waters of the Chess and the Gade meet the waters of the Colne, one of the tributaries of the Thames. Excepting some small scattered areas, such as those near Chesham and Leverstock Green, where tertiary outliers occur, the country is chalk, usually covered by post-tertiary deposits of very variable thickness and composition.

Being essentially a chalk country, many of its valleys and dells are normally dry, but, large areas being covered by the aforesaid post-tertiary deposits, the short grass characteristic of a chalk country is to be found only on parts of comparatively small extent. Numerous woods and copses occur in most parts, and there are also many large private estates and parks, in some of which are many fine Deer. Further, on several of the commons found in most parts of the country there are extensive growths of bracken and furze, which often serve as cover for Pheasants, Partridges, Rabbits, Foxes, and other animals.

There are only a few large sheets of water, and these are connected with the rivers or the Grand Junction Canal; this canal, it may be stated here, runs along or close to the old bed of the Bulbourne (a tributary of the Gade) and that of the lower Gade. On the higher grounds, *e.g.* on Chipperfield Common, Cholesbury Common, and Berkhamsted Common, and at Wigginton, Hastoe, and various places between Chesham and Berkhamsted, there are many small pools, the depths of which rarely exceed five feet.

It cannot be said that, in number of species, the aquatic fauna is a rich one, but this disadvantage, from a naturalist's point of view, is compensated for by the remarkable differences between the faunas of the several pools. These differences will be best understood from the following account of the fauna, given in accordance with the method previously explained. The Rotifers, as already stated, will be dealt with first, commencing with some of the commoner ones.

ROTIFERA.

1. *Salpina mucronata*, Ehren.—In those pools in which there is a large quantity of weeds, especially duckweed, this is one of the commonest Rotifers. From April to September the specimens are very numerous, and in May and June large numbers of empty loricas of the same Rotifer are also to be found. The presence of a large quantity of duckweed and the situation of the pools at a comparatively low level seem to favour the occurrence of large numbers of *S. mucronata.* This, at least, is what my notes suggest. Where these conditions are found, *e.g.*

at Langleybury Pool (elevation above sea-level about 200 ft.), Berkhamsted Castle moats (about 300 ft.), and Parsonage Farm Pool, Abbots Langley (about 400 ft.), the numbers of specimens obtained have been very large; on the other hand, at Wigginton Pool (700 ft.), among the Chilterns, the numbers obtained have not been nearly as large as in the pools before mentioned. Again, at many places close to the Chess, the Gade, the Bulbourne, and the canal, are extensive watercress-beds, through which the river or canal waters are diverted. Some parts of these beds have been much less disturbed than the rest, and contain, besides watercress, small quantities of starwort and duckweed. In these parts only comparatively small numbers of specimens of *S. mucronata* are usually found.

Often when seen beneath the microscope the specimens of *S. mucronata* swam about quite freely and rather rapidly, but if the water on the slide contained some vegetable matter, they usually spent their time by moving about this. Their long toes, resembling the blades of ancient Roman *gladii*, were frequently swung forwards so as to be almost parallel to the long axes of their bodies. The comparatively large, bright red cervical eyespot was always easily seen.

2. *Pterodina patina*, Ehren.—Most of the specimens of this Rotifer were obtained from Langleybury Pool, the rest being chiefly from Parsonage Farm Pool, Abbots Langley, and Berkhamsted Castle moats. All those examined were taken during the spring and summer months. Very many samples of water from Parsonage Farm Pool were taken nearly every month during 1912 and 1913. Not a single specimen of *P. patina* was seen in the 1912 samples, but several specimens were obtained in March and August of 1913.

The specimens from Langleybury Pool were exceedingly numerous in May and June, 1913. Most of them showed a few bosses, but indistinctly. These Pterodinas usually glided slowly through the water, occasionally turning their edges to view, when they presented a comic resemblance to a broken-down pedlar carrying a load on his back. When gliding through the water with their dorsal surfaces exposed to view, the trunk-like foot was almost always out of sight, by reason of its being extended downwards to allow the setæ at its extremity to touch the slide; it was only occasionally extended horizontally so as to project a little way beyond the edge of the lorica.

3. *Pterodina valvata*, Hudson.—Among a large number of Pterodinas obtained from Langleybury Pool on May 12th, 1913, were some which, being but slightly stippled, were remarkably transparent. These presented about a dozen comparatively large bosses, which were well-defined and nearly equidistant. As they glided slowly across the field, these Pterodinas were beautiful objects. Fig. 1 represents one of them, its foot being drawn in order to show its peculiar form, although this particular specimen rarely extended its foot beyond the lorica, when exposing its dorsal part to view. After gliding about for some time, it attached itself by its foot to a piece of *Conferva* and then remained stationary or nearly so for a long time.

I did not see one of the specimens of *P. valvata* fold its lorica, although I watched for a time in expectation of seeing this phenomenon, from the occurrence of which the specific name of the Rotifer was derived. It seems, however, that *P. valvata* rarely folds its lorica, for Mr. P. H. Gosse says: "As a rule, the folding of the valves is somewhat rarely performed. I have observed probably hundreds at various times, and I think I have not seen half-a-dozen folded" ('The Rotifera,' &c., C. T. Hudson and P. H. Gosse, vol. ii. 1886, p. 113).

4. *Brachionus rubens*, Ehren.—A vast number of specimens of this beautiful and active Rotifer were obtained on October 3rd, 1913, from a small, shallow pool at the eastern side of Potten End, and close to the road from that place to Water End. The water of this pool was quite green with *Confervæ* and minute aquatic plants. Many specimens were also obtained on October 15th, 1913, from Wigginton Pool. The water of this pool also was of a green colour, as seen in the collecting bottles, but not nearly as green as the water of the Potten End Pool, there being only a comparatively small quantity of *Confervæ* and minute aquatic plants in the Wigginton Pool. This difference in the nature of the waters of the two pools probably accounted to an important extent for the great difference in numbers of *B. rubens* in the two pools. The waters of Potten End Pool had every appearance of a rich feeding medium.

Many specimens of *B. rubens* were seen swimming freely in the water on the slide, repeatedly lashing out with their long, flexible foot, while large numbers were attached to specimens of *Daphnia pulex*, *Cyclops serrulatus*, and what appeared to be young specimens of *Cyclops strenuus*. One specimen of *D. pulex* carried a large number of these Rotifers in the manner shown in fig. 3.

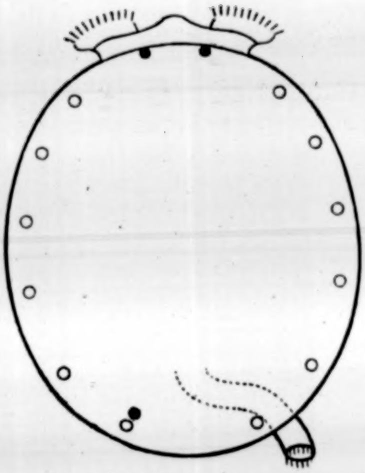

Fig. 1.

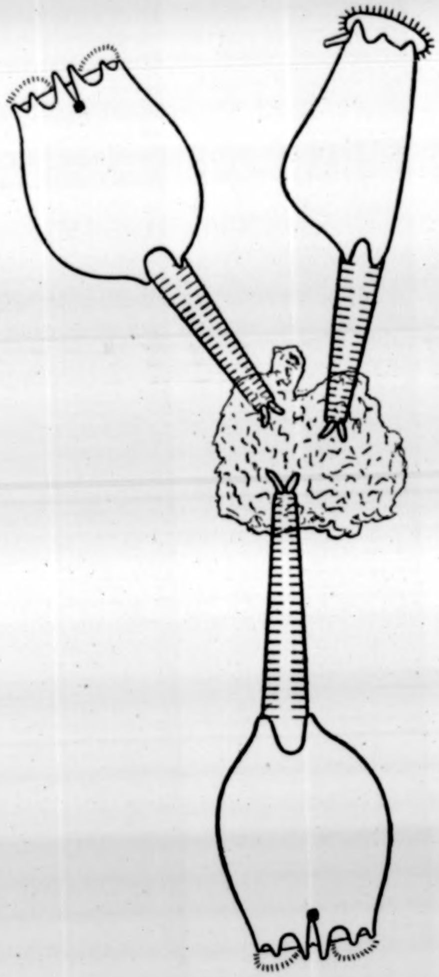

Fig. 2.

They were anchored to a layer of sticky, flocculent matter covering the head and part of the back of the *Daphnia*; this matter had evidently been secreted by the foot-glands of the Rotifers. While the *Daphnia* was in the field, the Rotifers gradually left it, one or more at a time, tugging violently to free themselves and causing their feet to be stretched out to a great length.

Fig. 2 shows three specimens from the Potten End Pool, after they had left the *Daphnia* shown in fig. 3, and still connected by means of a detached portion of the sticky matter. Their bright red eye-spots, like small rubies, were very conspicuous.

By killing the *Daphnia* or other host with a dissecting-needle, the Rotifers at once begin to struggle violently to free themselves, and so they do when a little cocaine solution is put on the slide. It may be mentioned here that the various species of Rotifers differ very much in their ability to resist the action of cocaine. Many of them at once contract considerably under its action, but some are affected somewhat slowly. One of these is *B. rubens*, for, when trying to induce contraction sufficient to allow its oral spines to be seen clearly, I have found it best to add cocaine solution to the water until the strength is nearly two per cent.

5. *Noteus quadricornis*, Ehren.—This well-known Rotifer is to be found more particularly in Parsonage Farm Pool, Abbots Langley, and in the old pool near the side of Chesham Road, opposite Ashlyn's Hall, Berkhamsted; this will be referred to as the Chesham Road Pool.

The specimens of *N. quadricornis* from these pools were all taken during the months of August and September. The most complete records of the appearance and disappearance of this species refer to the Parsonage Farm Pool; for instance, many specimens were obtained there on August 11th, 1912, some being very fine specimens indeed; a few were obtained on September 6th, 1912; on September 18th, 1912, six empty cases or loricas of the same species were obtained, but no living specimens; on September 22nd, 1912, I failed to obtain any trace of *N. quadricornis*. Among many collections of the forms of life in this pool, obtained during the ensuing months, I did not obtain a single *N. quadricornis* until August 18th, 1913. The Chesham Road Pool has yielded specimens as late as the very end of September.

Among the specimens obtained from Parsonage Farm Pool on August 11th, 1912, was a particularly fine one. It was a beautiful object, appearing in side view like a deep purse tobacco-pouch, with two strong spines projecting from its lower edge, and two strap-like projections on the upper or dorsal side of the mouth of the pouch and curling over a little. The pouch was faceted and transparent, allowing the parts of the animal to be seen. After moving about rather slowly it anchored itself by its foot to the slide, and, swaying to and fro, set its wheels in motion, causing strong currents of water to flow into the mouth of the pouch whereby small protozoa, &c., were carried to its powerful masticatory apparatus.

6. *Rotifer vulgaris*, Schrank.—This species is appropriately named *Rotifer vulgaris*, the "commonplace" Rotifer; in the mud of the various streams and pools and of the canal, in samples of their waters, in samples of moss, in damp mould, in the green coverings and the washings of trees and walls, some Rotifers of this species are easily obtained. Sometimes, *e. g.* in washings from a fern-pot saucer in December, 1912, and in washings from moss cbtained from Nettleden in June, 1913, they were very numerous and constituted nearly the whole of the rotiferan fauna.

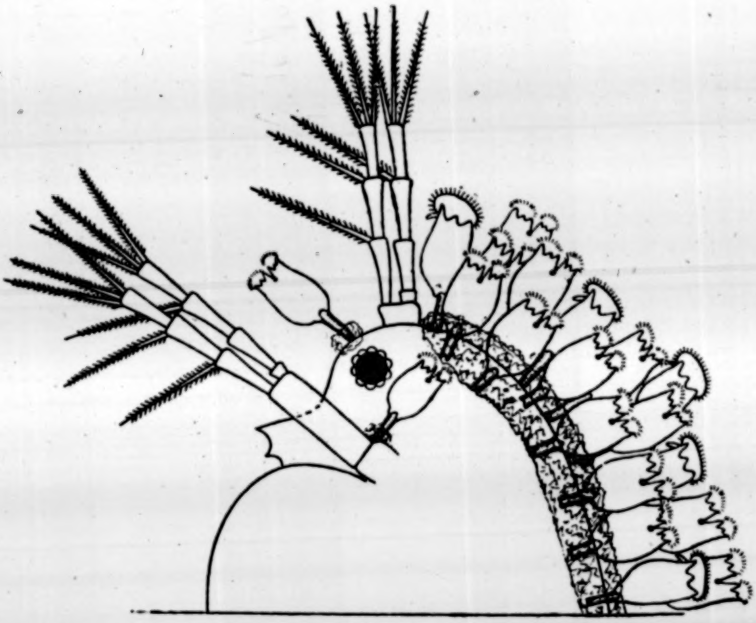

Fig. 3.

During examination under the microscope, they often moved somewhat slowly in leech-like manner, but soon made their way into small collections of mud and organic matter on the slide, wandered about and through these, and, finally emerging, started to swim, with expanded wheels, until they met other collections of mud and organic matter which were similarly explored. At other times they remained anchored for a long period.

The specimens of this Rotifer varied much in size, but were usually about $\frac{1}{50}$ in. long. The largest I have seen was, as far as I could measure it, $\frac{1}{30}$ in. long, when fully expanded. This Rotifer was washed from a silk net which had been dragged for a long distance along the canal, below Hunton Bridge, on November 12th, 1913; it was almost the only form of life obtained on this occasion. It was, however, the finest specimen of its species that I have ever examined, and its movements on the slide were all that could be desired to display its form and allow of sketches being made. After moving about on the slide, in water quite free from mud or organic matter by which its movements could be concealed, it anchored itself and scarcely moved out of the field for about half an hour. During this time, the Rotifer repeatedly extended and withdrew itself slowly so as to assume sometimes the form shown in fig. 4, and sometimes that shown in fig. 5, stretching itself so fully that its joints appeared as very fine lines, its external contour being almost unbroken. In these positions, the whole of the foot was not seen, but occasionally the Rotifer threw itself smartly from the position shown in fig. 4 into that shown in fig. 6. At such times, the full length of the Rotifer was seen, but never for more than a second, for it always quickly resumed the position shown in fig. 4 or fig. 5. Its exceedingly well-displayed movements, its elegant tapering form, its small, round red eye-spots, and the beats, about two per second, of its jaws against the anvil, were all well seen. The figures do not, I think, exaggerate the elegance of form of this Rotifer.

7. *Rotifer macrurus*, Schrank.—This large and well-known Rotifer, which is much less common than *R. vulgaris*, has been obtained chiefly from the Chesham Road, Langleybury, and Parsonage Farm Pools. From none of the water samples taken from any of the pools has the number of specimens of this Rotifer been large; in samples, *e.g.*, obtained from the Parsonage Farm Pool, on September 6th, 1912, and yielding fourteen specimens of *Salpina mucronata* and six of *Noteus quadricornis*, only one specimen of *R. macrurus* was obtained.

Every specimen examined exhibited very similar movements. The long foot was often extended so as to allow seven joints to be counted with ease, and occasionally eight joints were readily distinguished. After remaining for some time in an extended form and anchored to the slide, the Rotifer would retract its anterior parts, display its powerful wheels and stout column, and swim rapidly through the water. When travelling in leech-like manner, *R. macrurus* often showed, what was very rarely shown by *R. vulgaris*, a lateral view of the hinder part of its foot.

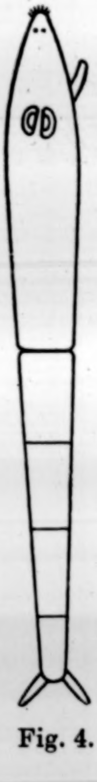
Fig. 4.

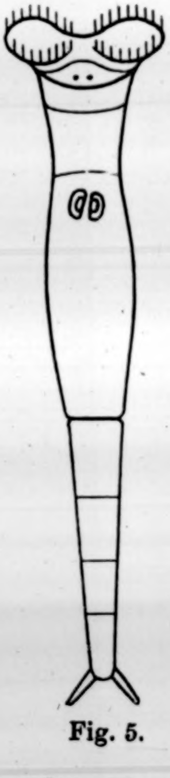
Fig. 5.

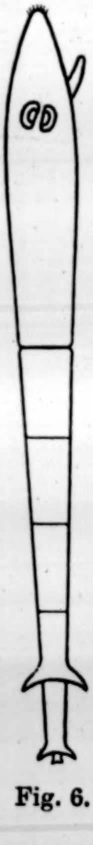
Fig. 6.

8. *Rattulus rattus*, Müller.—From only a few pools have I succeeded in obtaining specimens of this Rotifer. A few were taken from Parsonage Farm Pool, Abbots Langley, on March 24th, 1913. One was carefully examined as it swam about rather rapidly and gracefully, turning itself about its long axis, and swaying its foot to and fro. It was brought to rest by means of a few spots of Rousselet's narcotizing solution, and

its length was found to be about $\frac{1}{70}$ in. Its long and slightly curved toe was approximately as long as the rest of the animal. The very short styles at the base of the toe were seen, but only with difficulty. The central part of the Rotifer was brown, and the rest was almost colourless.

Another specimen, obtained on April 28th, 1913, from a small pool, a little to the east of Hastoe and close to the bend of the Hastoe and Cholesbury Road, measured $\frac{1}{80}$ in. in total length, and presented the features mentioned above. The water of this pool was exceptionally clear and transparent, but a few months ago the pool was completely filled in with clay and gravel.

9. *Synchæta tremula*, Ehren.—This small and very active Rotifer is fairly common in the watercress beds of the Chess and Gade, and in a few pools in which the water is clear. The specimens I have examined have been chiefly from the Cashio watercress beds, near Watford, and from Chipperfield Common Pool. The movements of *S. tremula* are so characteristic that, apart from the conical form of the animal and its small size, they serve at once to identify it. A description of the movements of one very active specimen, obtained on October 3rd, 1912, from the Cashio watercress beds will make this clear.

While examining two specimens of *Amphileptus* in a drop of water from the aforesaid beds, the illumination of the field being very brilliant, the *Synchæta* suddenly shot across the field. Being altogether unprepared for its appearance, the only impression it produced was that of a minute flash of light. Paying no further attention to the specimens of *Amphileptus*, I quickly moved the slide so as to enable me to follow the Rotifer, which was soon found spinning rapidly about its axis, which was vertical and practically stationary. Owing to its rapid rotation, the only impression produced was as shown in fig. 7. After a few seconds, the Rotifer darted across the field, appearing like a cone moving base forwards. Following it again, the Rotifer was found swinging itself in a very tortuous course about a piece of *débris* to which it was anchored by a very fine thread extending from its toes, as shown in fig. 8. This thread, as is well-known, is secreted by the foot-glands of the Rotifer. For some time, these various movements were repeated in varied succession.

Of the many species of Rotifers examined, *S. tremula*, especially as exemplified in the specimen just described, appears to be the most active. As long as that specimen was disporting itself in the way described, it was practically impossible to make out its characteristic features. A little narcotizing solution, however, soon brought it almost to rest, when its small foot and minute toes, small auricles, and the almost flat base of its conical body were clearly discernible.

10. *Synchæta pectinata*, Ehren.—Most of the specimens of this Rotifer, entered in my notes, were obtained from Chipperfield Common Pool, which has a very interesting rotiferan fauna. From one side of this pool a narrow plank-walk extends towards its centre, the depth of water near the end of the plank being less than four feet. A dredging net, moved about for some time in the water, from the end of the plank, usually brings up one or more specimens of *S. pectinata*, but dredging during winter and spring has been most successful.

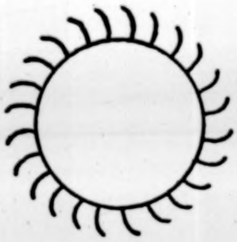

Fig. 7.

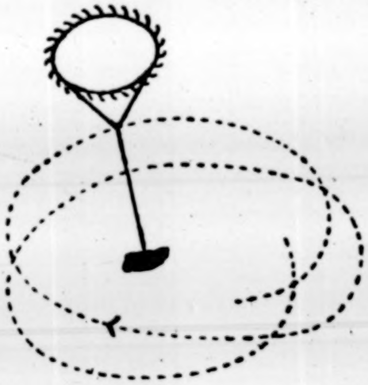

Fig. 8.

Several specimens of this beautiful and active Rotifer, remarkable for their whiteness and transparency, were obtained in the way described, on May 1st, 1913. One specimen, which was moving about with more energy than the rest, was examined carefully. It was not less that $\frac{1}{80}$ in. long, and swam forward rapidly, then doubled on itself, and swam rapidly in the opposite direction, these movements being repeated time after time. Little more than the curved sides of its conoidal body and its very convex oral end could be made out while the Rotifer was performing these rapid movements. Its distinctive pair of anterior tufted projections and its large pendent and richly ciliated auricles were, however, very clearly seen after it had been narcotized. Two specimens were obtained by dredging from the end of the plank and beneath the ice which covered the pool on January 27th, 1914. Both were very rapid in their movements, and one of them went through évolutions precisely like those described above; the other, however, went round and round for some seconds in a flat spiral, and then swam in the same manner as the other, repeatedly doubling on itself. These and other specimens obtained during the winter did not seem to be as brilliantly white and transparent as the specimens obtained in the spring.

Quite recently, on April 11th, 1914, I obtained several specimens of *S. pectinata* by dredging in the clear water of Bedmond Pool, which is situated in a deep excavation at the northern end of the village. These specimens and those from Chipperfield Common Pool are the only ones so far obtained.

(To be continued.)

A DIARY OF ORNITHOLOGICAL OBSERVATION MADE IN ICELAND DURING JUNE AND JULY, 1912.

BY EDMUND SELOUS.

(Continued from p. 74.)

June 19th.—One of the notes of the Golden Plover is a sad "pee-bier, pee-bier" (I prefer that spelling of the second syllable), and no words can impart any adequate idea of the protracted plaintiveness with which the last syllable is uttered. It is as though the bird's whole spirit were one of sadness—of pensive depression—which, however, it almost certainly is not. Another—generally speaking, one may say *the* other—note at this season is the single, melancholy "peep," equally in consonance with the spirit, to our human senses, of the wild, waste, and desolate scenes amidst which it is usually heard, merry as the bird's heart may be within it at the time.

Some time between 8 and 8.30 a.m. I saw the pair of Grebes, which have not yet laid, far out on the lake. Five or ten minutes later, on reascending the crest of the hill, I found that one of them—the male, I believe—had come into the little nook or corner where lake and stream join; and here he seemed to be waiting, almost stationary, upon the calm water (for it was a still, cloudy morning) for the other to join him. In a few minutes the female came diving up from the outer lake, and the two, meeting, drew close to one another, and began to press eagerly forward in the direction of the creek. It was exactly the way in which they had come up it, before, to the nest, on which coition had then taken place, and I expected a repetition of this. I have little doubt that they had the idea in their minds, but all at once they paused in what seemed their intent advance, floated a little asunder, came close again, and after confronting one another for a little in a hesitating manner, and once more increasing the distance between them, both suddenly dived and came up almost together, each with a substantial quantity of decaying weed in their bills. With this they began swimming towards the stream, but first one (the female) and then the other dropped it in the water again, and the advance continued *expeditus*. The female led, and seemed more eager than the male, who, as she disappeared into the creek, paused a little before continuing to follow her. I might have augured ill from this, and after having got to my place of observation, commanding the nest of these birds—who were now quite hidden behind the bank and intervening shoulder of the hill—I waited in vain for their reappearance round the bend of the stream, a little above where it enters the lake. The male, as was so often the case with the Great Crested Grebes I watched, had evidently cooled off. Getting on to the lake side of the hill again, I found him waiting alone, as he had been before, and in the same place, just outside the mouth of the rivulet. After some ten or fifteen minutes he dived up the lake again, and very shortly afterwards the female returned from the creek, and, swimming to where he had but lately been, appeared to wait for him in her turn. After some time, however, as he did not come, she went out into the lake herself, diving and swimming, and I lost sight of her too. It seems as if the birds, when they have had enough of the open water of the lake, or feel some special homeward call, are accustomed to repair to this end of it, at the mouth of their stream, where they wait for each other preparatory to swimming up it, to the nest. But what was the meaning of the foregoing incident with the weeds? A reference to my paper on the domestic habits of the Great Crested Grebe* will show that a pair of the latter acted in precisely the same way, but more fully, inasmuch as each of them took hold of the same piece of weed, and, holding it thus between them, and standing upright in the water, like two Penguins, moved backwards and forwards with it, after which, dropping it in the same way, they both swam eagerly to the nest, on which coition was effected. The subsequent conduct of the birds we are now considering will show the same curious apparent relation between two things which one would not suppose were in any way conjoined.

The following took place between 9.10 and 9.55 a.m. The female Grebe, after being for some time out of my sight and knowledge on the lake, reappeared in the little nook or bay of it before-mentioned, which I am sure now is the birds' accustomed trysting-place. Before very long the male appeared far out on the water, and with several long dives was soon at the same spot. He made his last emergence close in at shore, and then swam out again towards the female, with his head and neck held straight out before him in one line on the water, the beak driven through it like a ram. She awaited him in alert, sprightly mood, and when he was a few yards off, suddenly flew away from him over the water, coming down on it again at a little distance. There was now a quiescent interval, the female slowly approaching the male, but undesignedly, as it were, and without anything marked in her manner, till a similar but also less marked advance, on his part, towards her, ended in the mutual flight of both. I think the details were that when the male had reached a certain degree of nearness to the female, she flew at him, coquettishly, and he away from her; but it was so quick and sudden, and so much, in appearance, at the same moment, that I am not sure of this. The pair flew thus into and up the stream, and came down upon it when they had gone a little way, behind the curve of the nearer bank, which quite hid them. I hurried down the hill again to my observatory, and, before I had got into place, had the satisfaction of seeing them rounding the second bend of the stream. They swam in a most purposeful and mind-made-up manner, side by side and close together, pressing on at top speed, and uttering a variety of sounds which I find it impossible to retain in my mind, and cannot therefore transcribe. They were not loud, but not low either—distinctly audible at a fair distance—and not harsh in character. The pair soon came opposite to where I lay concealed amidst the stones on the hillside, pressed through the rushes, and were at the nest. They swam close about it, peered up at it, dived, and then the female, springing on to it, began to arrange the loose-lying materials, and bend down the growing flags amongst them.* Then, assuming the invitatory attitude, she obviously awaited the male. He, however, not ascending immediately, she came off into the water again, and there was more ministering to the needs of the nest; or, rather, as I should be inclined to say, more secondary sexual activity in regard to it, on the part of both the birds, several pieces of the growing sedge being pulled off by them and laid upon it, especially by the female, who then mounted on to it again, and, standing up, pulled more flags down upon it, and detached and laid down pieces of them in the same way. She then, a second time, invited the male to come up by assuming the appropriate posture, but, being again disappointed, again came off, and they both continued for awhile to add material to the nest; then swam a little away from it, and remained quiet amidst the sedge. In a moment or two, however, they approached the nest again; the female once more ascended and lay along it, and she was now quickly followed by the male. His attitude, as far as I could see, for the rushes, which a little obscured him, was well-nigh upright, and in the considerable pause which preceded coition he uttered a peculiar deep guttural note ("kor-r-r"), which, or something like which, I think I have heard at the end of the long, cat-like mew. During coition both birds were extremely vocal. As before, the notes of either differed, but I cannot keep the odd sounds in my memory distinctly enough to transcribe them. From coition the birds passed immediately to the associated instinct, the female whilst still on the nest. The male, however, did not stay, but, sliding off it, began to busy himself as before. There was then another short retirement, another approach, another ascent and invitation on the part of the female, which was not responded to by the male, after which the birds came out on the water, preened themselves, floated at ease, and finally went to sleep.*

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* 'Zoologist,' 1901, p. 339.

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* So far as I remember, I have not seen the Little or Great Crested Grebe do this.

I think the facts here recorded justify me in saying that there is, in the minds of these birds, an intimate association between the marital act and the construction or manipulation of the materials of the nest, and this same bond of connection I have made out, with certainty, in the case of three other species, representing altogether three different families and, moreover, all these four species habitually pair on the nest. Now, if it were known with certainty that the structure which we call a nest, and which, in the great majority of birds (as I suppose, or will assume), is put to that use, and that use only, which the word implies for us, had been originally put to the very different one of coition, and that this had come about through that act having been repeatedly performed in one and the same place, so that the female, waiting in that place for the male, had sometimes laid her eggs there, and thus, through the operation of Natural Selection, came, in time, to incubate them, an office which had been previously left to the sun, as in reptiles, and as it still is, with birds, in the case of the Megapodes, which stand lowest and therefore nearest to reptiles*—if these things were known, I think it will be admitted that the above facts would be held to receive a simple and natural explanation in the process of evolution through which the nest had passed. Since birds used to pair on the archaic nest, before they laid their eggs there, no one could wonder that, by inherited association, the ideas of pairing and nest-making were still connected in the minds of many of them, whilst some continued to act like their ancestors. Similarly, it will, I think, be also allowed that if it were known that the actual process of nidification had grown out of the objectless snatching up by birds of sticks, twigs, leaves, &c., from the ground, and dropping them again upon it, when sexually excited, either before, after, or during copulation, it would not then be held strange that they should sometimes now act in this manner, as I have, in fact, observed them to do. If, then, certain facts, *if* known, would be accepted as an explanation of certain other facts which *are* known, the postulation of these unknown facts, to explain the known ones, must be held legitimate, so long as they are not irreconcilable with other facts belonging to the subject. I submit that all the following actions (which I have actually seen) are explicable on the hypothesis here indicated, *viz.*:—(1) The nervously excited seizing of things from the ground, and letting them drop again, by the male bird whilst in a state of sexual frenzy, on account of the female, during the courting period. (2) The taking up and playing with materials similar to those of which the nest is composed, by both the male and female bird, immediately followed either by a visit to the nest and coition upon it, or by a start in that direction, with every appearance of there being the same intention, even though it may not be carried out (3) The further association of these instincts—coition, namely, and nidification—at the nest itself. In some of these cases the addition to or manipulation of the material composing the nest, by the female bird, is immediately followed by the invitatory attitude on her part, and as instantly follows the act of coition upon it. The male also joins in these nidificatory acts, both before and after the rite, so that the two forms of activity seem to be united in the birds' minds, and to make together the purpose of their visit. In other instances the female alone acts thus, after coition only. (4) The taking up and again letting fall by the female of the materials of the nest, whilst actually *in coitu* upon it, so that here we see the two things, as it were, in combination. (5) Habitual coition on the nest, commencing from a period when this word can only be used in relation to place and not structure, and continuing certainly up to the laying of the first egg, and probably afterwards. (6) The remaining of the female on the nest, after coition has taken place there, for an indefinite period, during which the act is repeated. This last, I think, is an important point in my theory, for if it now be asked why the female should remain, for any time, upon a spot or structure which afterwards becomes the nest, for any other reason than such as is connected with the eggs or with nidification, it can be answered that she does so in expectation of the return of the male, and consequent repetition of the act of coition. This helps us greatly in understanding how any place that has once, if only by chance, been made use of for this purpose, might become a more or less permanent pairing-place, through the female bird waiting on upon it, in which case the eggs would sometimes be laid there; and since incubation by the parent bird must be held to be of benefit to the species, we might expect that, from this point, Natural Selection would have brought it about.

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* No case of functional hermaphroditism was observed by me in this species, but I may take this opportunity of recording that this is habitual in the case of the Little Grebe, to go by a pair which I have since watched under conditions rendering mistake impossible. My observations on the Great Crested Grebe, in this particular, are, therefore, more than corroborated.

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* "The *Megapodiidæ*, with the *Cracidæ*, morphologically seem to be the lowest of the order, with which apparent fact may perhaps be correlated their singular habit of leaving their eggs to be hatched without incubation,"—Prof. A. Newton, 'A Dictionary of Birds,' vol. i. p. 539. A. & C. Black, 1893–1896.

On the above view, the first early acts from which the instincts both of incubation and nidification have been, through Natural Selection, developed, were entirely unintelligent ones, due to the intense state of sexual excitement which birds fall into, every year, on the approach of the breeding-season, and, under the influence of which, they may be actually seen to go through the oddest and most uncouth actions, having no imaginable object, unless the relief of pent-up emotion can be said to be one, and which seem as little the outcome of any process of reason as it is possible for an act to be. This state of overwrought excitement and intense nervous energy of a special kind I have called the sexual frenzy, and if the important main act which arises out of it—coition, namely—may be called an instinct, all those secondary ones which accompany and surround it—rollings, tumblings, springings, prostrations, flutterings, cryings, callings, melodisings, &c., must be pronounced instinctive also. As everybody knows, these storms of desire are either, in themselves, more acute, or, at least, produce a greater crop of strange movements in birds than in any other division of the animal kingdom. Consequently, we have, in their case, a larger output of what one may call waste material for Natural Selection, if possible, to put to some use, so that, far from its being extraordinary, we might have expected, if the principle relied on be a true one, that something very special and particular would have been evolved under its action. And Natural Selection, in my opinion, has answered to the call, for out of this maelstrom of blind, formless animal movement, with nothing but sheer concupiscence behind it, she has, on the one hand, evolved the most elaborate, ordered and beautiful forms of sexual display, and, on the other, the still greater and seemingly wholly dissociated marvels of nest-building. This view of the common origin of both these instincts has the merit of simplicity, and moreover it strikes at the root of various objections which are constantly being brought against the theory of one of them only, namely, sexual display, though logically they should be equally valid against the other also. The fact that some birds make no nests at all, or do so in such a slovenly fashion that they might just as well not, or that, in some cases, the nest is put to another and totally different use (as I have now shown to be the case) is not urged as an argument against the undeniable relation which it has to egg-laying and incubation in other cases, or in these also; but it is thought that because the sexual antics of some birds make but a poor sort of display, or do not seem designed to that end, or not exclusively so, or are performed by dull-coloured species, therefore the most highly developed and finished exhibitions, carefully gone through by the most beautiful male birds of the world, who thus show off their best points to the best advantage before the females, and may be *seen* actually to win them by so doing, are not real courtships, or real courting displays, either—even though they may have to be called so.* But if it is out of a number of odd, uncouth, violent, and wholly unintelligent movements made by male birds (for the most part) during what I have called the sexual frenzy, that Natural (here called sexual) Selection has, through the consequent excitation of the female, gradually evolved the true nuptial display, this state of things is precisely what we might expect—in fact, *ought* to find, and the argument is quite parallel as applied to the stages of nidification. What the objection to this view is I really do not know. It cannot surely be supposed that here alone we should find the crown of the edifice only, the flower without its stalk. It is in accordance with the principle of evolution that there should be a passage from the simple to the complex, from the generalized to the specialized; and out of what, more naturally, should the movements of sexual display have arisen than out of sexual movements? As to the contention that because a male bird is dull-coloured it cannot, through pose and exhibition, make the best even of its dullness, and thus produce a greater or lesser degree of sexual excitation in the female—or *vice versâ*—I have never been able to follow it. The concupiscent element seems to be forgotten by those who make this objection, and also that æsthetic perception must necessarily develop within the limits of what there is to perceive. Even so, however, there is not only beauty of form, as well as of colour,* but also a good deal of beauty in colours to which we apply the term dull. In short, in and for the opposite sexes of even the most sober-suited species, there are objects to see and desire, and these objects vary. What more should be wanted for sexual selection to make a foundation † upon? And with all this denial and scepticism, what other even tolerable explanation has ever been given of very beautiful sexual adornment in combination with a very elaborate and careful display of it, by which both the details and the general effect of the beauty are shown forth, or, as it were, insisted upon?

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* Because they so obviously are. In the case of the Blackcock I have actually *seen* the hen won by the courtship of particular birds, though by far the greater number were resisted. "Resisted" is the right word, for the effect of the display, as such, was always apparent.

Supposing incubation and nest-building to have originated in the manner suggested, it might seem that we have here two very important instincts with which reason can neither have, nor have ever had, anything to do. But there is another way, as it appears to me, by which intelligence might enter into the composition of an instinct, than through the odd one of lapsing on entry, and that it has done so in the above two instances is a view that seems more in accordance with the whole of the facts than that they are, now, in all cases, entirely devoid of this factor. Why should not reason, in the course of time, have become grafted, so to speak, on to the main stem of unintelligent, motiveless actions?‡ In this I can see no difficulty, for the variations of intelligence must be as much under the dominion of Natural Selection as those of irrational action, nor need they always, that I can see, become instinctive through lapsing. As time went on, it can hardly be questioned that, through individual memory, some conception would have begun to arise in the minds of birds as to the connection of the present building of the nest, for instance, with the future use to which it was to be put, and this must almost necessarily have passed, by degrees, into their having a clear purpose in building it, which they would probably be quite unable to distinguish from the strong instinct to do so, by which they would really be swayed. When once this point had been reached, the most intelligent birds, working, as one may say, perceptively as well as instinctively, might, without introducing any one great modification, have yet made many small improvements, and as the slowly increasing sum of these began to give them an advantage, this general superiority of intelligence, as well as the special results of it, would have been selected through the same agency, *pari passu* with any instinctive—that is to say, non-intelligent—beneficial variation. Thus the two forces would have become mingled in varying degrees, according to the greater or less intelligence of the species (since the general factor would be likely to be reflected in any particular application of it) but with a preponderance more or less marked, and always great, in favour of the latter.

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* A wing, spread effectively, for instance—still more a pair of wings—is beautiful even though it be brown, of which truth there can be no better proof, outside Nature herself, than in some of the plates in Mr. Howard's masterly work on the Warblers.

† In out-of-the-way parts where there are only a very few women, who happen (*mirabile dictu*) to be plain, these step forth as beauties, and act, and are acted by, as such. Still more is this the case with only one. Is not the law, here, alike for high and low?

‡ "We had a kitten which sucked its mother and when a month old taken to ——, and sucked another cat; then to —— and sucked two other cats, and then its instinct was confounded and became mixed with reason and experience; for it tried repeatedly to suck three or four other kittens of its own age which no one, as far as I am aware, ever saw any other kitten do. Thus born instinct may be modified by experience." (Darwin's MS. notes, quoted in Romanes' 'Mental Evolution in Animals,' ch. ii. p. 172.) And why not in wild nature, on the up-grade?

If the nest-building instinct has, in its origin, had nothing to do with the "sexual frenzy," then it is certainly odd that the picking up and letting fall, or laying down again, of objects from the ground, or material from the nest, should, in some birds, be a feature of the paroxysms to which I have given that name, both some time, a little or just before, during and immediately after coition. No act lies more at the very basis of the instinct, is more absolutely essential to it than is this; and, moreover, occurring under these circumstances, it must be deemed a peculiar one. Yet if we do not recognise the connexion here suggested, we must see in it only a mere irrelevant coincidence. Again, it is noticeable that some of the movements by which birds—even such as are fairly advanced in the art—build their nests have an odd sort of resemblance to essentially sexual ones. The Peewit, during early spring, goes through peculiar movements on the ground, as the result of which a circular depression, closely resembling that in which the eggs are afterwards laid, is produced, and it places in this, moreover, some scanty materials, such as grass-blades. The general idea is that the cock bird alone does this, but I have seen both sexes act so, as a sequel to coition; and also make little pecks at the ground at or beside the places rolled on. The most marked features of these performances, which seem clearly sexual, are the pressing of the breast against the earth, with a sort of rolling motion, and the strong downward pressure of the tail, or rather anal parts generally, with spasmodic movements, such as, in the male, accompany coition. The wings are drooped, extended from the sides and slightly quivered; and with these actions the pecking at things on the ground is also conjoined. The action here noticed with the tail as well as with the wings is a perfectly useless one, (at any rate, as it is practised, for the bird's hinder parts are tilted into the air), in connection with the making of a shallow pit or hollow; but it is effectively employed by the Blackbird in shaping the rim of its well-built and very differently placed nest. There is also here the same pressure and movements of the breast and wings, by which the cup is shaped, and, whilst thus acting, the bird has a very curious appearance, for it seems to be in a sort of ecstatic state rather than exercising a purely mechanical craft. I cannot but think it odd, if nidification has been purely architectural in its beginnings, that any bird should have thought of employing its tail in this way. It may not be beyond the possibilities of intelligent adaptation (though we do not see many such), but I must look at the manner as well as the matter, and find it easier to suppose that one and the same cause lies at the root of these movements in the concupiscent Peewit, the building Blackbird, and the incubating, or fostering, Merlin—*et sic de ceteris*. If the nest, as an adaptation to the needs of the young and the practice of incubation, grew out of the place—at first unmodified and then strewed with some light litter of flung-about materials merely—where birds were accustomed to pair, we can see why, in the case of some species (we do not, by any means, yet know how many), the old habit and the old association of ideas is continued. Otherwise, however, these facts are not easy to explain. Architecture, properly so called, cannot be supposed to flow naturally out of the primary sexual emotions, and if the nest is the outcome solely of constant small acts of intelligence of a constructive kind, a bird, when building, should be in a very different state of mind from that in which it is when under the influence of passion. The two things, instead of being mentally associated together, through their common origin and consequent habitual concomitancy, might be expected to be cut off from each other; nor would Natural Selection, as far as one can see, have at all tended to favour their union. Nor does she, upon the view which I advocate. On the contrary, she must be looked upon as a differentiating and specialising agency, whilst she at the same time makes use of the force of heredity. She has changed one trifling and wholly irrelevant instinct that arose, rhythmically, as a mere nervous adjunct of the sexual stimulus, into the important one of nidification; and if she has not yet eradicated all traces of the steps by which she has brought this about, yet she is, as it were, constantly striving to do so, since the tendency must be for mere useless actions, representing a waste of energy, to drop out and disappear before useful ones. Again, there seem many reasons against a habit of pairing on the nest, arising, as it were, *per accidens*. If it is continued after the laying of the eggs (as I have reason to think that, in some cases, it still is), these may, in consequence, suffer; nor does an artificial structure seem to offer any particular convenience for the act itself. One must recognise this where pairing begins on the site of the nest, and only comes to be upon it (the actual nest) as the building (or rather heaping) progresses. In the case of the Grebes it may appear otherwise, yet there are generally low and flat shores in the vicinity of their breeding haunts; and, moreover, it is scarcely possible to imagine any species having actually to rear a structure in order to facilitate or make possible this primary physical act, on which its continuance depends. No bird, one must suppose, could have become aquatic beyond its capacity for this functioning, under the new conditions, though an acquired habit might have been transferred from the land to the water. In the case of a non-aquatic bird, the whole surface of the country, according to its habits, is open to it for this purpose, whereas coition on the nest may be attended with more or less of inconvenience. Thus Rooks have this habit, though it is not a constant one with them ;* and, as I have myself observed, they often suffer severely for it, for no sooner are a pair seen to be acting in this way, than as many of the rookery as happen to be there assembled, taking the cue one from another, set violently upon them, and the nest becomes shortly covered up beneath a mass of tumbling, struggling birds. The scene, indeed, is so animated and the main features of it—birds flying from every direction to one particular nest, with a general scrimmage upon it—so marked, that it has occurred to me it may often have been misinterpreted as the destruction of the nest of some couple convicted of pilfering. One would only need not to be there at the beginning, and not to stay till the end, to fall into this error quite easily. There is, however, no doubt as to the true cause in these cases, however established the other one (which I have not myself witnessed) may be. It is, I think, remarkable that the Rooks should cling to a habit attended with such severe penalties. If it has its roots deep down in the sexual instinct, or its concomitant developments arising out of the sexual frenzy, then here is an explanation ; but otherwise it is not easy to understand how, in the face of such difficulties and discouragement, it should ever have established itself. To conclude, on the supposition that the nest was originally the pairing-place, we have an explanation of the facts to which I have here referred, but all of which I have not yet fully recorded, nor need their being exceptional (though as to the extent to which they are we are yet in ignorance) surprise us, since the differentiating and specialising process, which is at work everywhere, would be sufficient to account for this. On the other hand, if these two instincts—nidification and the sexual or pairing one—though thus sometimes, as I have shown, combined and intermingled, have yet, so far as the origin and growth of the former are concerned, had nothing to do with one another, the fact of their being so is surprising, and has yet to be accounted for.

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* Rooks are not included amongst the four species mentioned by me as pairing habitually on the nest, nor do they belong to any of the families represented by these.

BIRD LIFE ON THE ISLAND OF EIGG.

By J. Kirke Nash, L.D.S. (Ed.), F.Z.S. (Scot.).

Having arranged with my friend Mr. David Hamilton to visit the Island of Eigg for the purpose of observing the Manx Shearwater (*Puffinus anglorum*) at its nesting haunts, we landed there from the s.s. 'Claymore' at the somewhat inconvenient hour of 11.30 p.m. on June 20th last and left again on the 24th, when we crossed over by motor-boat to Arisaig. Anxious to make the most of the few days at our disposal, we called early next morning upon Mr. Glendinning, the factor on the island, to whom we had an introduction, and he kindly gave us any information we required regarding the nesting localities of the "Fachach"—the local name for the Shearwater, and which I believe means "night-bird."

The Island of Eigg is roughly divided into two mountainous portions by a valley which runs from the little bay at Kildonan on the east side to the Bay of Laig on the west. The larger section lying to the south-west of this valley rises to a considerable elevation, attaining a height of over 1300 ft. at the "Scuir of Eigg," which forms a notable feature in the landscape. The other portion of the island runs more directly north, and is really the more interesting part from an ornithologist's point of view. Huge basaltic cliffs on the west side surround the Bay of Laig for over a mile in extent, and from their base a nearly perpendicular slope descends for a great distance to the level ground, on which stands the crofting township of Cleadale. Right at the top of this steep, immediately under the beetling crags, the nesting-burrows of the "Fachachs" are to be found. Walking along the top of these cliffs to their north-western extremity, the immense height of which greatly impresses one, and where a magnificent view of the Island of Rum can be obtained, we slowly made our way down, which required very careful footing owing to the friable nature of the rocks, and cautiously making our way along the foot of the sheer face we soon came upon the burrows of the Shearwaters, but it took us some little time before we found the birds, and also the best method of getting at them, for being nocturnal in their habits, they are never seen leaving their nests, and they are also very silent. We found over a dozen nests, and took out several of the birds. As they can bite rather severely—sufficient to cut the skin—it is advisable for the "Fachach" hunter to protect his hands with gloves when investigating the holes. If returned to the entrance of the burrow the birds immediately sought the nest again, but wishing to see their flight, we launched one or two of them into the air, when they flew down the declivity at a great pace, with very direct flight, right out into the Sound of Rum. One bird which was beyond our reach in its burrow made a curious crooning or grunting sound whenever we attempted to seize it. I mention this specially, as all the others were quite silent. Owing to the nature of the ground, the burrows only penetrate directly inwards for a short distance, when they run off for several feet, at right angles along the face as it were, and to many of them there was an entrance at either end. Passing in the hand as far as the arm could reach, we never could feel the birds nor the nest containing the single white egg, and it was only by judging the direction of the holes and digging through the face with the aid of a stout walking-stick that we got at them. All the nests we found had eggs, though in most cases they were highly incubated, and the chicks could be heard cheeping inside. The nests were very primitive in structure, a small quantity of dry heather-twigs apparently constituting the whole affair. It would be somewhat difficult to say whether the burrows were made by the birds themselves. Many are probably excavated by Rabbits, but as many of the holes would hardly admit one's hand, I am rather inclined to think they are dug out by the birds. Working on the rock face under a blazing sun proved very laborious, yet so extremely fascinating it was only when the sun began to sink behind the hills of Rum that we thought of leaving the scene.

Having now accomplished the main object of our visit, we devoted the whole of the following day to traversing most of the coast-line round the southern half of the island, from Laig on the west to Kildonan on the east, besides visiting about a dozen small lochs scattered among the hills around the "Scuir," with a view to discovering what bird life was on the island. On the third and last day of our visit we made an excursion by motor-boat to Muck, which lies between three and four miles to the south, and whilst crossing the Sound of Eigg we had an interesting encounter with a Lesser Rorqual Whale. Sailing close inshore to view the sea-birds which abound on the high cliffs along the south coast, our attention was drawn to the huge dorsal fin of the monster as it swam along near the surface of the water, and bringing the boat round we ran alongside of it, passing between it and the shore. We could see the creature from head to tail, and estimated it to be at least thirty feet long by comparing it with the boat, which measured twenty-eight feet. Mr. Glendinning, who was with us, gave it a prod with one of the heavy oars we had in the boat, when it plunged down and disappeared.

We spent an hour or two on Muck, which is a flat fertile island, forming a strong contrast to Eigg, and also landed on one or two islets, where numerous sea-birds breed.

Although presenting a somewhat barren appearance when viewed from a passing steamer, the Island of Eigg—which lies about ten miles west from Arisaig, the nearest mainland—is so pleasingly diversified by hill and dale, besides possessing a fair share of woodland on the east side, that it is not altogether surprising to find such a large variety of bird-life as abounds. So far as I am aware, no account of the birds of Eigg has appeared since 1892, when an entertaining chapter on Eigg was given by Mr. J. A. Harvie-Brown in his book on the 'Vertebrate Fauna of Argyll and the Inner Hebrides.' The account, however, as the author states, is largely based on a previous one written by Mr. William Evans (published in the 'Proceedings of the Royal Physical Society,' vol. viii., 1884–85), who visited the island in June, 1884. In the 'Zoologist' for 1888 there also appeared an interesting paper on the subject written by A. H. and H. A. Macpherson.

Mr. Evans personally observed fifty species, and from various sources of information he made up a total list of eighty-four. Of these, however, *viz.*, the Bullfinch, the Short-eared Owl, the

Slavonian Grebe, the Great Shearwater, and the Storm Petrel, Mr. Macpherson held that they could not be admitted owing to insufficient evidence. Mr. Macpherson's list numbered ninety-five species, but how many of these were from personal observation he does not state.

Our list, which numbers fifty-three species, only includes those seen by ourselves, and of these several have never before appeared in any published list. It also proves the breeding of some other species suspected or unknown to do so. Had we been able to prolong our stay I have no doubt the number could have been considerably augmented, as the wooded parts entirely escaped our attention. Only a resident ornithologist would be in the position to produce a complete and authentic list of the birds on this island, as several species from higher latitudes are known to pass the winter there, and in addition to these there will doubtless be many birds of passage which could only be seen during the spring and autumn migration.

The subjoined list gives a detailed account of all the species that came under our notice, and every bird mentioned was carefully identified :—

1. MISTLE-THRUSH (*Turdus viscivorus*). — A few were found near the centre of the island feeding in the open. No previous record of this species has been given.

2. SONG-THRUSH (*Turdus musicus*).—Very common. Many were seen along the seashore and throughout the bleaker parts of the island quite away from the woods.

3. BLACKBIRD (*Turdus merula*).—Several were seen in localities similar to those in which we met the Mistle-Thrush.

4. WHEATEAR (*Saxicola œnanthe*).—This was a fairly common species. We observed a good many pairs frequenting the rough ground one usually expects to find this species on.

5. WHINCHAT (*Pratincola rubetra*).—These were also quite common, especially on the rough ground bordering the roadside on the way to Laig.

6. ROBIN (*Erithacus rubecula*).—We only encountered one bird, which was evidently feeding young on a wild part south of the Scuir.

7. WHITETHROAT (*Sylvia cinerea*).—We came on a number of

these at Laig, amongst the rough herbage, brambles, and meadow-sweet bordering the grassland.

8. Willow-Wren (*Phylloscopus trochilus*).—Several observed. In summer, no matter what part of the country you wander in, this species seems ever present.

9. Hedge-Sparrow (*Accentor modularis*).—One bird seen on a very barren part towards the west coast.

10. Wren (*Troglodytes parvulus*).—We were not long on the island before this lively little bird made us aware of its presence with its merry outburst of pleasing song.

11. Meadow-Pipit (*Anthus pratensis*).—This species was frequently seen and heard all over the island.

12. Rock-Pipit (*Anthus obscurus*).—We observed a number on the rocks along the south shore and also on Muck.

13. Swallow (*Hirundo rustica*).—Mr. Macpherson records having seen one bird. We saw several and found them nesting at Laig.

14. House-Sparrow (*Passer domesticus*).—This species does not appear in Mr. Evans's list, though included in Mr. Macpherson's. We saw several on both sides of the island. They were nesting in a barn at Laig House.

15. Twite (*Linota flavirostris*).—We met a number of these birds, particularly on the heather slopes towards the south-west and perching on sallows near a small marsh.

16. Corn-Bunting (*Emberiza miliaria*).—Although said to be one of the most prevalent species on Eigg, we met with but few birds.

17. Yellow Bunting (*Emberiza citrinella*).—These were distinctly more numerous than the previous species.

18. Starling (*Sturnus vulgaris*).—According to previous records, this species seems to vary greatly in number. It was undoubtedly the most numerous of all the smaller birds during our stay; indeed, it was swarming in some parts, and we found several nesting among the ruins of the deserted crofts at Grulin on the south side.

19. Raven (*Corvus corax*).—We saw one bird on the cliffs at Cleadale.

20. Hooded Crow (*Corvus cornix*).—Said to be a regular pest in Eigg, but we only encountered a few birds.

21. Rook (*Corvus frugilegus*).—We noticed several in the centre of the island not far from the schoolhouse, but saw no indications of a rookery as mentioned by Mr. Harvie-Brown (1886).

22. Sky-Lark (*Alauda arvensis*).—The song of these melodious birds could be heard all over the island.

23. Cuckoo (*Cuculus canorus*).—In the vicinity of the Bay of Laig the call of the Cuckoo often broke upon the ear amid the general silence, and these birds were well distributed over the island.

24. Barn-Owl (*Strix flammea*).—In the inn at Laig we saw a stuffed bird taken the previous winter in the barn by the shepherd.

25. Common Buzzard (*Buteo vulgaris*).—When at the Shearwaters on the cliffs at Cleadale, a pair of these birds were circling high overhead, uttering their shrill mewing cry, and next day at the wild rocky headland of Rhuda-an-Aeseid, on the south-west, another pair were seen. One of the birds repeatedly flew to and from the cliff face, whilst the other circled high above the waters of the Sound of Rum. We suspected they had young, but the overhanging nature of the rocks prevented us from obtaining a view of the supposed nesting-site.

26. Peregrine Falcon (*Falco peregrinus*).--Whilst sitting on the top of the cliffs watching the Buzzards and enjoying the beauty of the scene, a pair of Peregrines were noticed dashing along the face of the precipice.

27. Shag (*Phalacrocorax graculus*).—At several points along the sea-cliffs we were able to see some distance along the shore and on the rocks below we could distinguish many of these birds. They nest in the numerous caves that penetrate the cliffs all along the coast.

28. Gannet (*Sula bassana*). –If reliance can be placed on an ancient account by Dean Munro, who visited the Hebrides between 1540 and 1549, it appears these birds at one time nested on the cliffs of Eigg. His quaint description is interesting: "North from Ellan Muchd be foure myles, lyes an iyle called iyle of Egga, foure myle lange and twa myle braid, guid maine land with a Paroch Kirk in it and maney Solane geese." We saw two of these birds diving and fishing in the Sound of Rum, within a mile of the shore.

29. **Mallard** (*Anas boscas*). — In a reedy pond near Laig House we came across several young birds and also a hatched-out nest on a hill loch.

30. **Common Eider** (*Somateria mollissima*).—We saw a number of these birds both on the east and west side of the island, and found it nesting on Castle Island.

31. **Rock-Dove** (*Columba livia*).—A large number of these birds frequent the numerous caves, one of which is known as Pigeon Cave, in the high sea-cliffs that terminate the steep slopes from the Scuir on the south side. It is near here that the famous cave penetrating 300 ft. is situated, in which the McDonalds of Eigg were suffocated by the McLeods of Skye when they raided the island.

32. **Red Grouse** (*Lagopus scoticus*).—Although the ground is eminently suited for this species, there appeared to be very few of these birds.

33. **Pheasant** (*Phasianus colchicus*).—We saw several of these among the heather on the hill slopes—a rather unusual situation. No previous record has occurred.

34. **Corn-Crake** (*Crex pratensis*).—Quite common, especially in the meadows around Laig Bay. During the night the monotonous "crek, crek" was almost incessant.

35. **Ringed Plover** (*Ægialitis hiaticola*).—One pair on the sandy beach at Kildonan were observed. It seems that never more than the one pair is ever seen here.

36. **Lapwing** (*Vanellus vulgaris*).—Although informed that this bird had been observed in Eigg, Mr. Evans did not see it during his visit. We saw several birds, and on Muck we found a nest with two eggs.

37. **Oystercatcher** (*Hæmatopus ostralegus*). — We noticed several on various parts of the coast, and we came on a nest with two eggs close to a colony of Common Gulls.

38. **Redshank** (*Totanus calidris*).—One bird seen on the south side near the shore.

39. **Common Sandpiper** (*Totanus hypoleucus*).—Observed one pair near Grulin.

40. **Curlew** (*Numenius arquata*).—A number seen feeding on the shore at Kildonan, and others flying across the island.

41. **Common Tern** (*Sterna fluviatilis*).—Two or three birds

came quite close to the boat as we were passing Castle Island, which enabled us to perfectly identify them. We also saw a few near Muck. We did not expect to find this species here, and no previous record of it has been given. We looked for Arctic Terns, but saw none, though I understand they breed irregularly on several of the islets.

42. **Common Gull** (*Larus canus*).—We noticed individual birds on various parts of the island, but as a nesting species it was by no means numerous. We found a colony of over twenty pairs nesting on some shelving rocks on the south coast.

43. **Herring Gull** (*Larus argentatus*).—Nesting in small numbers at "Bidein Boidheach." Observed birds all round the coast.

44. **Lesser Black-backed Gull** (*Larus fuscus*).—The same remarks apply to this as to the previous species.

45. **Great Black-backed Gull** (*Larus marinus*).—We found these birds here and there over the island. Landing from a small boat under considerable difficulty at the foot of the high sea-cliffs about a mile to the west of the McLeods' Cave, with a view to finding a nest of the Black Guillemot, we came on a nest of this Gull containing one addled egg and a chick a few days old. It was a fine specimen, and even then showed the fierce nature of this species by pecking at and seizing hold of the finger held out to it. We also saw several nests on an adjacent islet.

46. **Kittiwake Gull** (*Rissa tridactyla*).—On the same islet we saw a number of these birds nesting.

47. **Razorbill** (*Alca torda*).—We saw one or two birds between Castle Island and Eigg, and several in the Sound of Eigg. We did not find it as a breeding species on the island, but we saw several nesting on a rocky islet a few miles distant.

48. **Common Guillemot** (*Uria troile*).—Observed several off shore in the Sound of Eigg, and also on the east side of the island. A good many were nesting on the same islet where we found the Razorbill.

49. **Black Guillemot** (*Uria grylle*).—These birds were numerous. We saw a pair on Castle Island and several on the south coast between Castle Island and the Dubh Sgeir. We met many on the water in the Sound of Eigg, also in Laig Bay, and one bird when crossing to Arisaig. They were mostly

in pairs, from which we concluded they were just starting to breed.

50. Puffin (*Fratercula arctica*).—A number of these birds were seen on the water close to the shore, and on an islet we found a large colony breeding.

51. Red-throated Diver (*Colymbus septentrionalis*).—When descending the steep slopes of Bein Tighe—the second highest point on the island—towards Loch Bein Tighe lying at its base, our attention was drawn to two birds resting on the water. Examining them through our glasses we easily recognized the species, and taking all the available cover we could we got fairly near without disturbing them. Wishing to see how near we could approach, our attention for the moment was taken up with the rough ground we were on, and on looking up again we found they had disappeared with surprising suddenness. This species forms a new addition to the Eigg list, as does also the next one.

52. Black-throated Diver (*Colymbus arcticus*).—We saw this bird in the Sound of Eigg at no great distance from the shore.

53. Manx Shearwater (*Puffinus anglorum*).—"The" bird of Eigg (*facile princeps*).

This completes the list, and the chief points of interest to which I would draw attention are, first, the Mistle-Thrush, the Pheasant, the Common Tern, the Red-throated and the Black-throated Divers form new records for Eigg. Secondly, although an allusion is made in one of the former lists to an unpublished record, the present is the first definite account of the Gannet having been seen at Eigg. Thirdly, only one example of the Common Swallow—a straggler—was observed by the previous recorders. We saw several and found it nesting. Finally, we proved the breeding of the Great Black-backed Gull and the Oystercatcher, and also the following species in the vicinity: the Puffin, the Kittiwake, the Razorbill, the Guillemot, and the Lapwing.

EARLY BREEDING OF THE CRESTED GREBE.

By O. V. Aplin.

There were five pairs of Great Crested Grebes on the lakes at Fawsley Park, Northants, on May 11th, 1914. The cock of one pair carried on his back a single young one, as big, perhaps, as a goose's egg. The cock of another pair carried either one or more (I could only make out one for certain, but think there were more) quite small young ones. Pike in the lakes probably accounted for the small number of the young ones. But Grebes also suffer a good deal from the depredations of the Crow family. When I was walking round the lake at Blenheim (where there were many Grebes) last June I picked up under a tree two Grebes' eggs most obviously sucked, and doubtless by some of the Crow family. The day I was at Fawsley was rather cold, with but little sunshine, and the young might be feeling the cold wind; or they might have been picked up by the old cock to get away from suspected danger as quickly as possible, for I think this is very often the reason for Grebes taking their young on their backs. At all events, I did not see the young on the water on this occasion. I think these were instances of unusually early breeding for this part of the country. There are good beds of old reeds and other water plants of this year's growth on the banks of the lakes in places, in the outside edge of which the Grebes would find ample cover for early nests. And it is the question of the presence or absence of cover, and the early or late growth of this, which determines the date of this bird breeding to a great extent. At Byfield Reservoir, for instance, where the cover is always late in shooting up (largely *Stirpus*), July is in most years the laying month with the Crested Grebe. The Grebes have been at Fawsley for nearly twenty years. Later in the afternoon, when passing one of the large ponds at Canon's Ashby, I noticed a pair of Crested Grebes on it.

NOTES AND QUERIES.

MAMMALIA.

Fecundity of the domestic Cat.—Our Cat is half Chinchilla half Persian, and she came to us just able to lap milk as a kitten. Her kitten record since then has been carefully noted in a book, copy of which is appended. Is not a litter of eight rather unusual? This was her last performance. All her progeny have been healthy and vigorous, and most have been light grey like herself:—

A Cat's Progeny.

		Number in each litter.			Number in each litter.
1909,	April 17	5	1911,	Aug. 10	4
	July 23	6	1912,	March 31	5
	Date not exactly			July 26	5
	recorded in Sept.	3		Nov. 30	4
	Dec. 1...	4	1913,	March 4	5
1910,	Feb.	7		May 19	4
	May 23	5		Sept. 2	6
	Aug. 10	4	1914,	Jan. 29	4
	Oct. 27 born dead	2		May 15	8
	Nov. 1..	2			—
1911,	March 31	5		Total	88

—Edwd. N. Mennell (The Hostel, Shirley, Croydon).

The Decrease of the Squirrel.—I wish to report that on May 8th, while with some friends near Ambresbury Banks in the northern part of Epping Forest, a good view was secured of a Common Squirrel. I missed it, but my wife, who is well acquainted with both species, was confident that it was the British and not the American species; indeed, a lady of the party remarked on its rich red colour. I cannot remember ever seeing a Squirrel in Essex, and certainly not within the past three years, when its absence first began to interest me. Dr. Laver, writing on the Mammalia of Essex in 1881 ('Epping Forest Transactions,' p. 169), stated that "it occurs in all parts of the county in suitable spots—that is, where there are woods"; but I have spent a good deal of time in such localities and never noticed the animal. Half a century ago it was common in most of the cloughs and valleys of that corner of the Pennines where the four counties of Lancashire, Yorkshire, Cheshire, and Derbyshire meet. There is an established tradition in Longdendale that formerly the woods were so dense that a Squirrel could pass from tree to tree between Staleybridge and Glossop; but this is a commonplace superstition that is applied to many other places which have been stripped of trees. In Longdendale it is also believed that the making of the Woodhead series of reservoirs drove the animal out of the district. It is not uncommon in the Goyt Valley, between Cheshire and Derbyshire, and abundant near Grindleford, which is in the latter county nearer Sheffield. Five years ago I saw a single individual in Bottoms Hall Wood, near Mottram, but this may have been an escaped specimen. Destruction of woodlands as the cause of the decrease of the Squirrel might be studied with greater caution, for reliable observers have described to me that fifty years ago it was well-known as an inhabitant of the scantily-clothed valleys of south-west Yorkshire, and could there be seen running along the stone walls. In other counties in Wales and England I have myself observed it far from any wood that could be termed dense.—F. J. Stubbs (Theydon Bois).

AVES.

Leisurely Nest-building by a Robin.—We all know how very quickly birds can put up a nest when they are in a hurry; but this season I met with an instance of the opposite kind. Observing a Robin carrying building stuff to the upper part of an ivied wall on March 8th, I examined the spot, and found two or three handfuls of material. The bird was seen building once or twice during the rest of the month, but when I went up (I had to use a ladder), the nest was far from finished. On April 12th it appeared at last to be finished, but was empty, and when I next went up on the 18th, it contained five eggs.—O. V. Aplin.

Blackcap wintering in Oxfordshire.—I saw a male *Sylvia atricapilla* in my garden on February 28th. It sang a little, but only got out one good high note. I noticed it at intervals until March 13th, when it sang well with some good high notes at the end of the strain, but not afterwards. It may have gone away, or been killed by a cat. Quite possibly it wintered in the garden, and remained unnoticed until it began to sing. During the time I had it under observation I found it difficult to see, as it generally sang from inside a yew tree or other evergreen. The weather was wet. Migrant Blackcaps appeared on April 30th, and we have more than we have had for some years. On May 3rd four, if not five, were singing not far from this house.—O. V. Aplin.

Gannet plunging for its Prey.—Perhaps the principal desideratum still remaining in the life-history of the Gannet or Solan Goose is a satisfactory photograph of this singular bird, taken whilst it was in the act of plunging into the sea for its prey, and the writer would be grateful to anyone who could secure him such a snapshot, which ought not to be very difficult to procure in the vicinity of the Bass Rock or Ailsa Craig, where Gannets are plentiful.—J. H. Gurney (Keswick Hall, Norwich).

Supposed Breeding of Tufted Duck and Pochard in Northants.—On May 11th, 1914, I had an opportunity of seeing what birds there were on the lakes at Fawsley Park, Northamptonshire. I was pleased to see, besides ordinary birds, three pairs of Tufted Ducks and a pair of Pochards. The ducks and drakes of the respective pairs of the Tufted Ducks kept close together and did not leave the water. The Pochards got up, and after flying round twice—uttering their loud rattling "carragh" as they flew past—pitched again on the lake. I think, from the presence of these birds at that late date in the spring, there is a strong probability that they intended to breed there, if indeed the ducks had not already begun to lay. Lord Lilford, in his 'Birds of Northamptonshire' (1895), does not give any instance of either of these ducks breeding in that county; but the fact of their doing so may have been noticed and recorded since that date. The Pochard has been suspected of breeding in Northants at Byfield Reservoir for some years past. I saw a pair there in August, 1895. On July 6th, 1900, I saw a drake in the same place. In 1903 the Pochard was believed to have laid eggs there—the keeper reporting a nest containing "brown" duck's eggs mown out on the banks. On June 14th, 1905, there were three drakes and four ducks on the water.—O. V. Aplin (Bloxham, Oxon).

Corn-Crake (Crex pratensis) in Essex.—On May 18th I heard a Corn-Crake in a meadow at Piercing Hill, Theydon Bois; it was there the next morning and the next night, but I have not heard it since. An unfamiliar quality in its note led me to time it, when I found that the "crake" was uttered at the rate of about twenty to twenty-three times a quarter minute. All those I have timed elsewhere have called at the rate of about sixty-two to the minute. A very funny article on the Corn-Crake in 'Punch' for May 27th, 1914 (obviously from the pen of a writer who knows the bird), describes the rate at ninety-eight to the minute. Judging from my own experience the slower and more familiar rate is decidedly soothing, while the ninety-eight bird threatened to become an intolerable nuisance. I have not previously heard the voice of the Corn-Crake in any of the south-eastern counties.—F. J. Stubbs (Theydon Bois).

London Notes.—One or more Great Spotted Woodpeckers have been frequenting one of the Highgate woods since the end of March, and presumably (if a pair) have nested in the locality. Chiffchaffs were heard at Highgate on April 1st. On the 30th of that month I observed a Lesser Tern on one of the Highgate Ponds. Tufted Ducks, at first a single bird, but ultimately two pair, frequented these ponds until the end of March. Carrion Crows are rather common there. I have observed four or five at once about the lower ponds in Parliament Hill Fields.—H. Kirke Swann (Finchley).

NOTICES OF NEW BOOKS.

Heredity and Sex. By Thomas Hunt Morgan, Ph.D., &c. Humphrey Milford, Oxford University Press, London.

This is an American publication, written by the Professor of Experimental Zoology in Columbia University. It reviews the principal facts, suggestions, and conclusions on the subject contributed by other workers, and gives the results of original study in the same field by the author. Such a volume is bound in its treatment to be more or less argumentative, but Prof. Morgan is unbiassed. He writes:—"It may not be desirable to accept everything that is new, but it is certainly undesirable to reject what is new because of its newness, or because one has failed to keep in touch with the times." To keep oneself in touch with all the novelties in evolutionary speculation, and to judge them by a familiarity with advanced zoological knowledge is now within the province of few indeed, and the excellent bibliography appended to this volume will show the study needed for an up-to-date judgment. Some applications of Natural Selection are discarded, and sexual selection as proposed by Darwin is given scant recommendation. We are struck with one conclusion enunciated by Prof. Morgan: "The return to Darwin's method rather than to Darwin's opinions marks the beginning of the new era."

This book is very fully and excellently illustrated.

The Care of Home Aquaria. By Raymond C. Osburn, Ph.D.
Published by the New York Zoological Society.

All publications on this subject are welcome, for we frequently find a new hint in management, and in an American guide we are introduced to fish and other animals outside our fauna which are not impossible to obtain for our own aquaria. Moreover, this communication is very fully illustrated, so that we can judge what are really desiderata.

Dr. Osburn states that "it was not until 1850 that the first properly balanced aquarium was described by Mr. Robert Warrington, of Manchester, England, in a paper entitled 'On the Adjustments of the Relations between the Animal and Vegetable Kingdoms by which the Vital Functions of both are permanently maintained.'" It may be well in this notice to supplement that reference. The author's name is to be spelled "Warington," and his paper was published in the 'Zoologist,' vol. viii., p. 2868 (1850), though it may have appeared elsewhere, as in a footnote he writes, "Since the reading of this paper" (which we believe was before the Chemical Society). Warington also published another paper, also referred to by Dr. Osburn, entitled "On Preserving the Balance between the Animal and Vegetable Organisms in Sea Water" ('Zoologist,' vol. xi., p. 4118 (1853), which, however, had been previously read at the Hull Meeting of the British Association, and also printed in the Ann. & Mag. Nat. Hist. for November, 1853.

Dr. Osburn gives some good directions for "clearing the aquarium," but although he refers to Tadpoles and freshwater Snails as scavengers, he does not advocate the use of the freshwater Mussels, one of which (*Unio tumidus*) is used by some keepers of aquaria with great success in this country.